SEROTONIN AND PEPTIDE INTERACTIONS IN MEDIATING FOOD-INDUCED AROUSAL IN THE MOLLUSC, *Aplysia*. I. Kupfermann, V. Brezina*, F. S. Vilim, E. C. Cropper, S. C. Rosen, & K. R. Weiss*. Center for Neurobiology and Behavior; College of Physicians and Surgeons Columbia University New York, and *Dept. of Physiology and Biophysics, Mt. Sinai Med. Center, N.Y.

Feeding in *Aplysia* provides an advantageous model system for studying the organization and cellular mechanisms underlying behavioral states. Feeding behavior exhibits the phenomenon of food-induced arousal, which is manifested by a progressive build-up of the magnitude and rate of biting. Food-induced arousal is due to the action of 5-HT and of peptides, which converge at several different sites, both in the central nervous system, and peripherally, at muscle. The 5-HT and peptides both activate a cAMP cascade, but the intracellular targets of the cascade differ at the different sites. The actions of 5-HT are mediated by a specialized neuron which can be excited independently of motor activity. Thus the action of 5-HT can anticipate future behavioral needs. By contrast, the peptides are released as a direct consequence of the activity of the sensory-motor circuitry that directly generates behavior. While some of the peptides function to increase the strength of contraction and the rate of relaxation of the muscle, other peptides released as co-transmitters, in part function to decrease contraction strength without affecting relaxation rate. Thus relaxation rate and the strength of contraction can be independently regulated. The net effect on muscle properties is a function of the relative proportions of the actions of 5-HT and the peptides. The peripheral effects of the modulators creates a form of auto-regulation that serves to optimize the efficiency of the system. Central actions also contribute to the auto-regulation, but in addition promote efficiency by anticipating needs before the behavior occurs. The choice of the particular type of modulator employed does not appear to follow any clear logic, and may be determined largely by evolutionary accidents. Supported in part by grants MH36730, GM32099 and MH35564.